

REMARKS

Claims 1, 4, 6-9, 19, 20 are pending in the present Application. Claims 10-18 are withdrawn, Claim 7 has been canceled, Claim 1 has been amended, and no claims have been added, leaving Claims 1, 4, 6, 8, 9, 19, and 20 for consideration upon entry of the present Amendment. A request for continued examination under 37 C.F.R. 1.114 also accompanies this amendment.

Amendments to Claims

Claim 1 has been amended to include the limitations of Claim 7, canceled herewith. Claim 1 has further been amended to change the term “oxidized hydrosilane” in steps (a) and (c) with the term “siloxane oligomer” to clarify that the oxidation of a hydrosilane oligomer leads to formation of a siloxane oligomer.

Claim 4 has been amended to change “hydrosilane compound” to “hydrosilane oligomer or cyclic hydrosilane oligomer” to show unambiguous antecedent basis in Claim 1.

Reconsideration and allowance of the claims are respectfully requested in view of the above amendments and the following remarks.

Claim Rejections Under 35 U.S.C. § 112, Second Paragraph

Claims 1, 4, 6-9, and 19-20 stand rejected under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. In particular, it is alleged in the Final Office Action dated January 21, 2009 what the compound (a) is, whether a silane or a siloxane oligomer.

Claim 1, as noted above, has been amended to replace the term “oxidized hydrosilane” with “siloxane oligomer” to clarify that the oxidation of a hydrosilane oligomer leads to formation of a siloxane oligomer, in accordance with the Examiner’s understanding of the claim. Accordingly, Claim 1 should now be acceptable to the Examiner. Reconsideration and withdrawal of the rejection of Claim 1, and its dependent Claims 4, 6-9, 19, and 20 is respectfully requested.

Claim Rejections Under 35 U.S.C. § 103(a)

Claims 1, 4, 6-9, 19, and 20 stand rejected under 35 U.S.C. § 103(a), as allegedly unpatentable over U.S. Patent No. 6,639,015 (i.e., International Patent Application Publication No. WO/0012640; “Nakashima”). Applicants respectfully traverse this rejection.

Nakashima discloses a polymer composition comprising (i) a polysiloxane and (ii) a readily decomposable resin. Col. 7, lines 10-12. In the Final Office Action on p. 4, section 8, second paragraph, it is alleged that Nakashima discloses a coating liquid for forming a silica-containing film comprising a polymer composition including i.) a polysiloxane which is a reaction product of silica particles and hydrolyzate of an alkoxysilane of formula (I):



and that the polysiloxane is obtained by a) mixing the silica particles and the alkoxysilane of formula (I) in an organic solvent and b) hydrolyzing the alkoxysilane in the presence of water and catalyst. Nakashima, Abstract and Col. 5, lines 45-56. The silica particles of Nakashima are prepared by the hydrolysis of an alkoxysilane of formula (I), optionally followed by aging. Nakashima, Col. 3, lines 7-9; Col. 4, lines 16-40.

For an obviousness rejection to be proper, the Examiner must meet the burden of establishing that all elements of the invention are disclosed in the prior art; that the prior art relied upon, or knowledge generally available in the art at the time of the invention, must provide some suggestion or incentive that would have motivated the skilled artisan to modify a reference or combined references. *In re Fine*, 5 U.S.P.Q.2d 1596, 1598 (Fed. Cir. 1988). “A patent composed of several elements is not proved obvious merely by demonstrating that each of its elements was, independently, known in the prior art.” *KSR Int’l Co. v. Teleflex Inc.*, 127 S.Ct. 1727, 1741 (2007). To find obviousness, the Examiner must “identify a reason that would have prompted a person of ordinary skill in the art in the relevant field to combine the elements in the way the claimed new invention does.” *Id.*

Claim 1 has been amended with the limitations of Claim 7, canceled herewith, so that the silane or silane oligomer in c) and d) is limited to Chemical Formula 4 or 5.

Claim 1 therefore specifically claims a silane compound being selected from the group consisting of a) siloxane oligomer, i.e., oxidized hydrosilane prepared by oxidizing

hydrosilane oligomer of Chemical Formula 1 or cyclic hydrosilane oligomer of Chemical Formula 2, in the presence of water or alcohol, b) cyclic siloxane represented by the following Chemical Formula 3, c) a mixture of the oxidized hydrosilane and silane or silane oligomer, and d) a mixture of the cyclic siloxane and silane or silane oligomer.

However, Nakashima fails to disclose a) the preparation of an organic silicate polymer from a siloxane oligomer prepared by oxidation of hydridosilane oligomer, and c) use of the siloxane oligomer in conjunction with the specific silane compounds of Chemical Formulas 4 and 5; and further fails to disclose b) use of a cyclic oligomer or d) a cyclic oligomer in conjunction with a silane or silane oligomer of Chemical Formulas 4 or 5. Though Nakashima discloses several silane compounds of Formula (I) and as exemplified in Col. 4, lines 25-40, each is different from the specific silane compounds of Chemical Formula 5, and none is either a hydridosilane oligomer (cyclic or acyclic) or a cyclic siloxane oligomer as claimed in Claim 1. Applicants note that Nakashima discloses first forming a silica particle (“fine particles of silica”), followed by condensation of the silica particles which have a particle diameter of 5 to 50 nm, with an alkoxysilane of Formula (I), and a “readily decomposable resin”. Col. 3, lines 21-32. Claim 1 does not disclose a “fine particle of silica”, but discloses only a siloxane oligomer prepared by oxidation of a hydridosilane oligomer (cyclic or acyclic, in options a) and c)) or a cyclic siloxane in b) and d). One skilled in the art will appreciate that neither a siloxane oligomer nor a cyclic siloxane is identical to the “fine particle of silica” disclosed in Nakashima, nor is the particle size of 5 to 50 nm a feature of the claimed siloxane oligomer or cyclic oligomer.

Furthermore, the “fine particles of silica” are provided, as disclosed in Nakashima, by the hydrolysis of alkoxysilane, where the fine particles of silica are densified and the moisture adsorptivity is lowered “and the amount of functional groups remaining on the particle surface is reduced”. Col. 4, line 66 to Col. 5, line 13. The siloxane oligomer, i.e., the specific oxidized hydrosilane oligomer and/or cyclic siloxane of Claim 1 have *no alkoxy group* (see Chemical Formulas 1-3 in instant Claim 1), and though Nakashima teaches reduced amounts of “reactive group” (i.e., alkoxy, as would be appreciated by one skilled in the art), Nakashima does not teach that no alkoxy groups are present on the fine particle of silica. Therefore the

fine particles of silica of Nakashima also differ in this respect from the siloxane oligomers and cyclic siloxanes of Claim 1, and are not therefore identical, and there is no suggestion or incentive in Nakashima to so modify the fine particles of silica to be free of alkoxy groups as Formula (I) of Nakashima *requires* 1-4 alkoxy groups ($n = 0-3$).

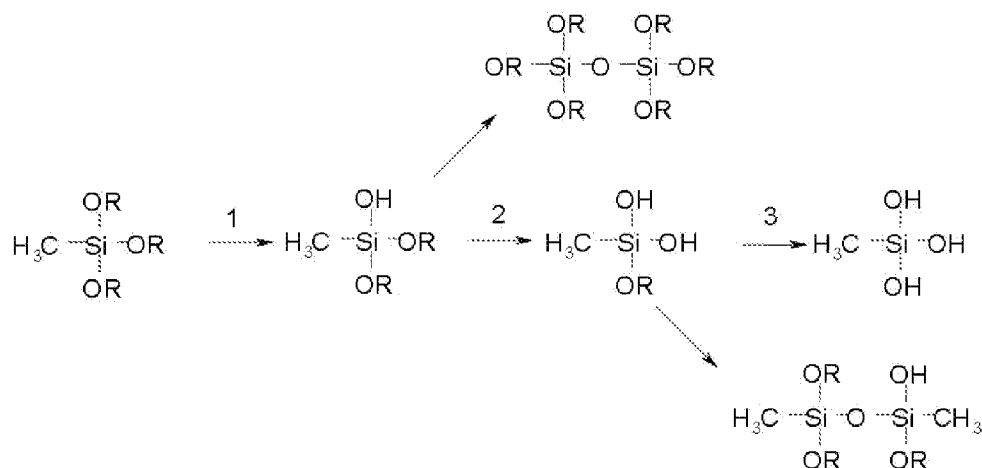
Nor is a “readily decomposable resin” a feature of the instant claims. One skilled in the art will readily appreciate that a “readily decomposable resin” disclosed as included in the polymer composition of Nakashima, is included to achieve a dielectric constant of 3 or less by generating a pore after decomposition, where the presence of pores (i.e., air pockets) reduces the dielectric constant, but adversely affects the mechanical properties such as the modulus of the film. To modify Nakashima to optimize mechanical properties at the expense of the dielectric constant would therefore render Nakashima unsuited to its intended purpose. The courts have held that “[i]f the proposed modification would render the prior art invention being modified unsatisfactorily for its intended purpose, then there is no suggestion or motivation to make the proposed modification. *In re Gordon* 733 F. 2d 900, 221 USPQ 1125 (Fed. Cir. 1984). The courts have also held that “[i]f the proposed modification or combination of the prior art would change the principle of operation of the prior art invention being modified, then the teachings of the references are not sufficient to render the claims *prima facie* obvious.”” *In re Ratti* 270 F. 2d 810, 123 USPQ 349 (CCPA 1959). Therefore, there would be no suggestion or incentive that would lead one skilled in the art to modify Nakashima to have the composition claimed in Claim 1, or its dependents.

As disclosed previously, and as reproduced below, the invention claimed in Claim 1 provides an organic silicate polymer having the specific cyclic structure, which is different from that prepared by using alkoxysilane, and thereby has superior mechanic property and low dielectric property. It is necessary to perform the hydrolysis and condensation of the siloxane oligomer or cyclic oligomer, which have no alkoxy groups, to provide an organic silicate polymer having the desired superior properties, i.e., *both* lower dielectric constant and superior mechanic property, useful for an insulation film of a semiconductor device.

Generally, and as in Nakashima, hydrolyzing and condensing of alkoxysilanes to prepare organic silicate polymers occurs simultaneously and is difficult to control and separate

these two reaction steps (hydrolysis followed by condensation), as shown in the following Scheme 1, provided here to illustrate the differences between Weidner and the method of instant Claim 1.

Scheme 1



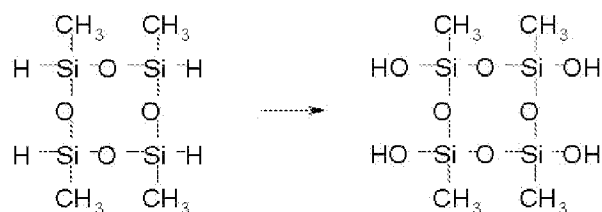
In Scheme 1, an alkoxy silane is condensed in advance of being fully hydrolyzed, so that it is difficult to prepare the fully hydrolyzed silane monomer 3, as seen in the above Scheme 1. Specifically, it would be excessively difficult to prepare the specific oxidized hydrosilane such as the fully hydrolyzed silane monomer 3 or cyclic siloxane as claimed in Claim 1, despite performing the hydrolyzation and condensation of alkoxy silane.

However, hydrosilanes or cyclic siloxanes as claimed in Claim 1 are oxidized to prepare the silane monomer, as recited in the following Schemes 2 and 3, which would provide a different hydrolyzed compound from that of an alkoxy silane.

Scheme 2

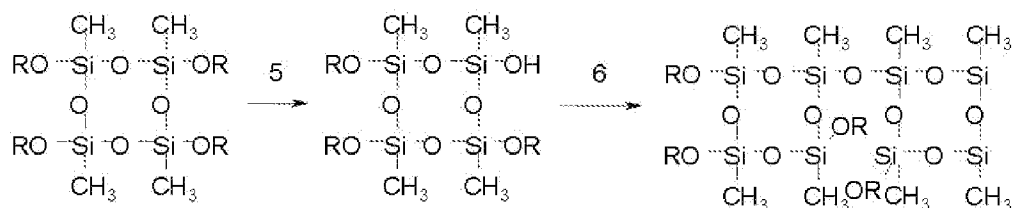


Scheme 3



Thus, by using the specific oxidized hydrosilane or cyclic siloxane selected from the group consisting of four mentioned a), b), c), and d), the present invention provides an organic silicate polymer having a specific cyclic structure, which is different from the structure that would be obtained by using alkoxy silane, as seen in the following Scheme 4.

Scheme 4



In particular, an organic silicate polymer prepared from the specific oxidized hydrosilane or cyclic siloxane of a-d of instant Claim 1 has a more interconnected structure, and shows a lower dielectric constant and superior mechanical properties (See Tables 1 and 2, Examples 1 to 6 and Comparative Examples 1 to 3 of the present application). These properties allow the use of the organic silicate polymer of the present invention in specific applications such as insulation films for semiconductor devices.

One skilled in the art will readily appreciate the vast differences in architecture of organic silicate prepolymers required for these different applications, based on the above exemplary schemes. There is no disclosure in Nakashima to teach or suggest the Applicants' specific structural requirements to provide the desired properties of low dielectric constant and high mechanical strength, as discussed hereinabove.

Hence Nakashima fails to teach or disclose all elements of the instant claims, and fails to provide a suggestion or incentive that would lead one skilled in the art to modify Nakashima to use a siloxane oligomer (prepared from a hydrosilane oligomer) or cyclic oligomer, each without alkoxy groups, to provide the limitations missing from Claim 1.

without changing the principle of operation of Nakashima. Nakashima therefore cannot render Claim 1, or its dependent claims 4, 6, 8, 9, 19 and 20, unpatentable. Reconsideration and withdrawal of the rejections are respectfully requested.

It is believed that the foregoing amendments and remarks fully comply with the Office Action and that the claims herein should now be allowable to Applicants. Accordingly, reconsideration and allowance are requested.

If there are any additional charges with respect to this Amendment or otherwise, please charge them to Deposit Account No. 06-1130.

Respectfully submitted,

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